International Center for Tropical Agriculture
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Implementation of mobile computing system to support the management of the operations in the CIAT Genebank

Angela Marcela Hernández
a.hernandez@cgiar.org
Diego Fernando Gonzalez
d.f.gonzalez@cgiar.org

ICTs4D
13,14 October, CIAT HQs

CIAT –Genetic Resources Program
Germplasm registered into Multilateral System of the Treaty

Crop	Conservation	Rank	No. of Taxa	No. of origin country	No of Accessions
Bean (*Phaseolus*)	Seeds	1	46	110	37.560
Tropical Forages	Seeds	1	33	28	6.643
Cassava (*Manihot*)	*in vitro*	1	734	75	23.140
Germplasm accessions as International Public Goods			**813**		**67.343**

CROP TRUST

The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

CIAT
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“The genetically heterogeneous materials handling is one of the most critical in a genebank operations”

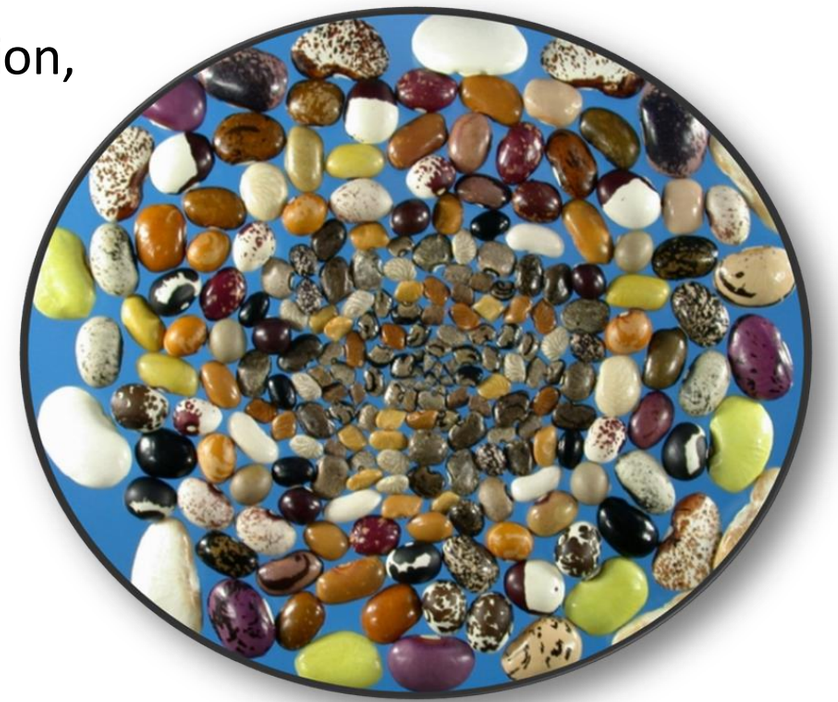
Rao, N.K., J. Hanson, M.E. Dulloo, K. Ghosh, D. Novell y M. Larinde. 2007.*Manual para el manejo de semillas en bancos de germoplasma, Manuales para Bancos de Germoplasma*No.8. Bioversity International, Roma, Italia.

Identification

-Knowledge about collections (Descriptors: Passport, characterization, evaluations)
-Crop curation
-Facilitated access and visibility of collections to Users
-Exchange of information

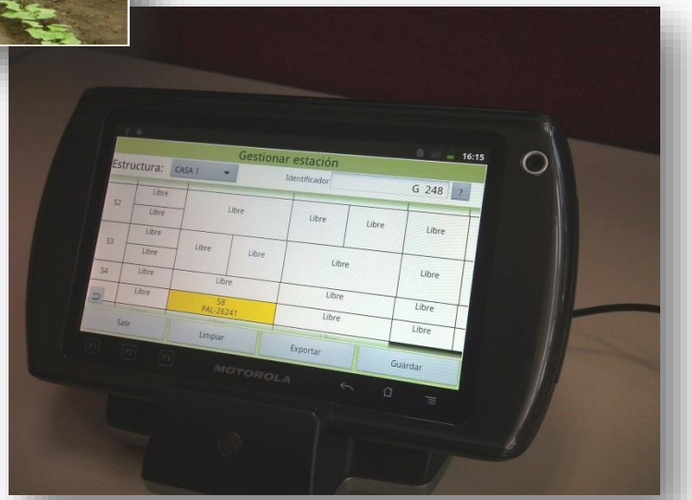
Workflow and process

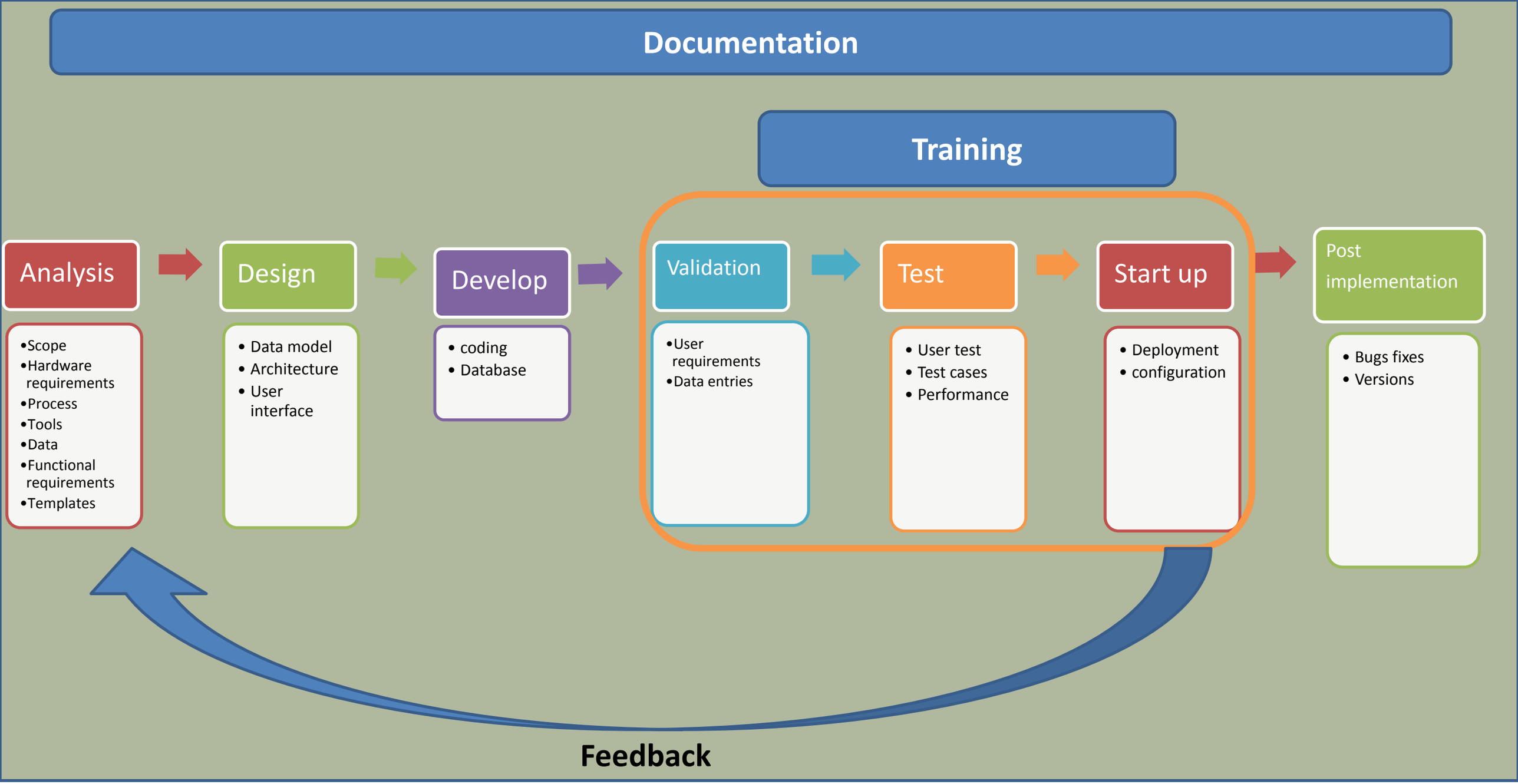
-Acquisition / Introduction
-Regeneration / Multiplication
-Conservation(Inventory/Monitoring)
-Viability tests
-Phytosanitary tests
-Safety duplication

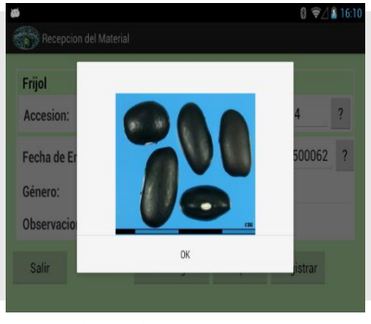
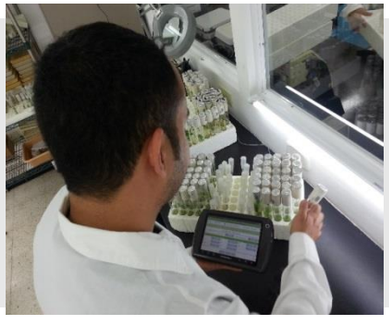


Adoption and implementation of mobile computing as a tool to improve efficiency in data collection and information management for the genebank operations

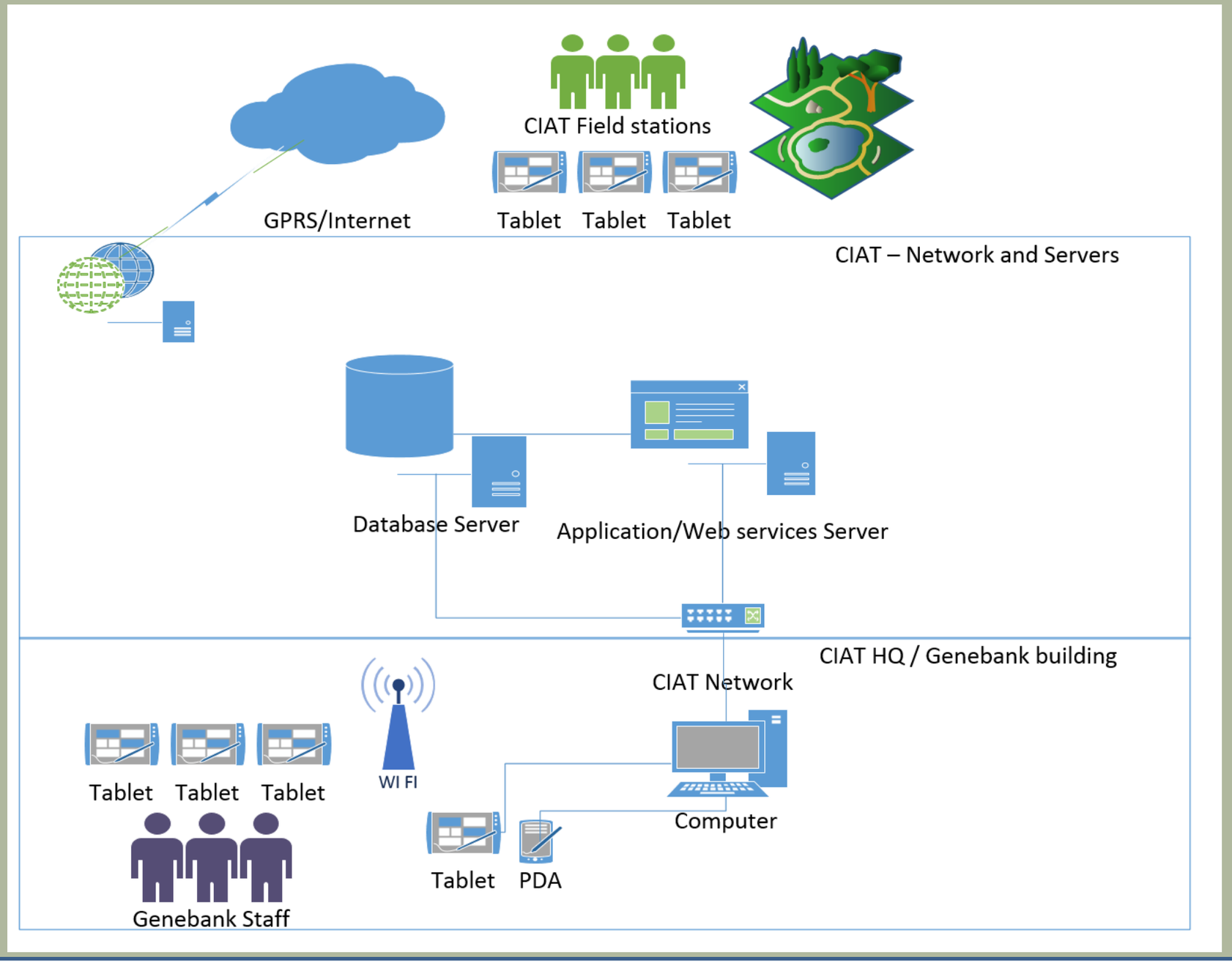
- ✓ Mobility (laboratories, field stations)
- ✓ Connectivity (on line-off line)
- ✓ Quality of data
- ✓ Centralization of data
- ✓ Integrity of data
- ✓ User-friendly
- ✓ Fast recovery information
- ✓ Flexible operation




Documentation
Training
Analysis
•Scope
•Hardware requirements
•Process
•Tools
•Data
•Functional requirements
•Templates
Design
• Data model
• Architecture
• User interface
Develop
• coding
• Database
Validation
•User requirements
•Data entries
Test
• User test
• Test cases
• Performance
Start up
• Deployment
• configuration
Post implementation
• Bugs fixes
• Versions
Feedback

Seeds production	Reception of seeds	Seeds viability laboratory	Germplasm Health laboratory (seeds)	in vitro Cassava conservation laboratory	Inventory and monitoring of seeds conservation
on line / off line connectivity	on line / off line connectivity	off line connectivity	on line / off line connectivity	Offline connectivity	off line connectivity
Harvest Plant Characterization Bar code printing	Seed tracking verification	viability evaluations	phytosanitary evaluations	Plant growth evaluations Subculture data	Inventory management
					
Fieldworkers Technicians Professional	Technicians	Technicians	Professionals Technicians	Professionals Technicians	Technicians


SQLite
Java EE
JavaServer™ Faces
JSF
Apache
Tomcat
ORACLE


CIAT Field stations
GPRS/Internet
Tablet
Tablet
Tablet
CIAT – Network and Servers
Database Server
Application/Web services Server
CIAT HQ / Genebank building
CIAT Network
WI FI
Tablet
Tablet
Tablet
Computer
Tablet
PDA
Genebank Staff

Challenges

Resistance to the use of tablets by some users, as they were afraid of losing their data

Some users not familiar with mobile devices

Actions

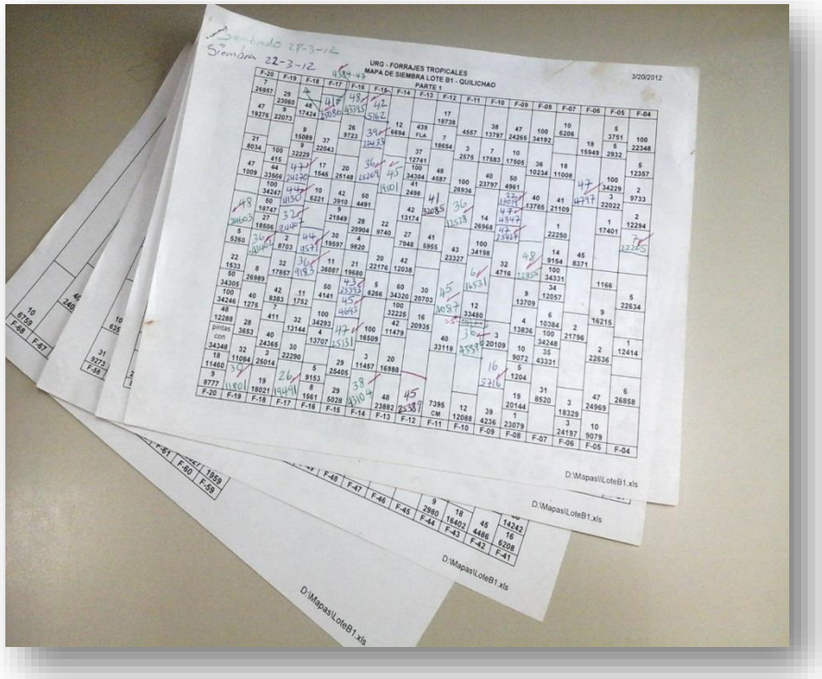
Engaged users with active participation: feedback and training

Challenges

No full coverage of wireless points in the work areas of Genetic Resources Program

No connectivity with experimental stations (Popayan, Santander de Quilichao, and Tenerife)

Paper formats, tacit knowledge

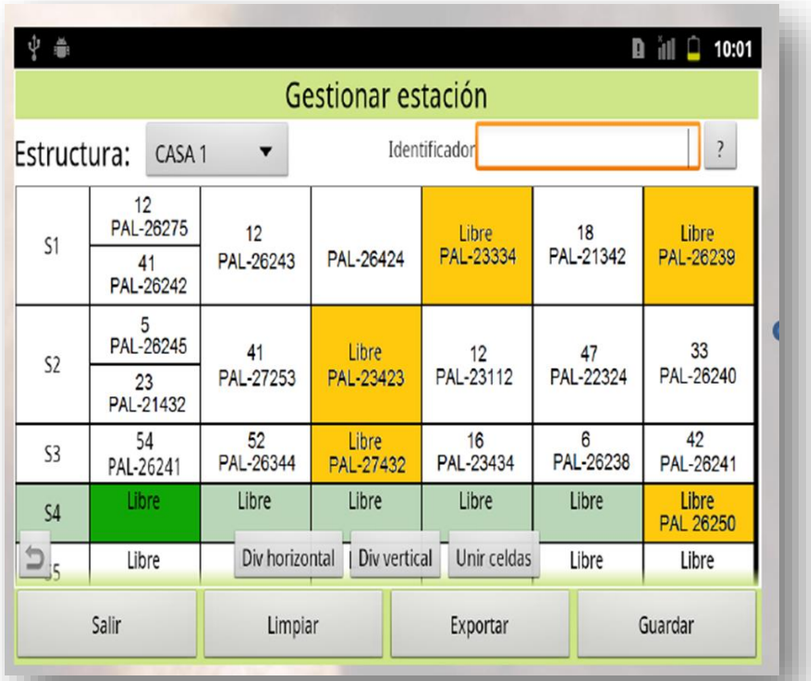


Actions

Off line synchronization

Internet plan with local carrier

User friendly app: visualization, fewer touch, workflow



Benefits and impact

- Optimizing data collection time
- Results of evaluations are immediately available
- Automatic compilation of information
- Consolidated information transferred wireless/GPRS into the central database
- Minimize errors in the data taking during the evaluation
- Ensure data quality: type of data, validations of data entries, sufficient and necessary data
- Material traceability through the identification of materials with barcode

Trends

- Data collecting from non human sources

Weather station

iRobot’s new drone is a rock-steady flyer

References

Rao, N.K., J. Hanson, M.E. Dulloo, K. Ghosh, D. Novell y M. Larinde. 2007. *Manual para el manejo de semillas en bancos de germoplasma, Manuales para Bancos de Germoplasma* No.8. Bioversity International, Roma, Italia.

Painting, K.A., Perry M.C., Denning,R.A. y Ayad, W.G. 1993. *Guía para la Documentación de Recursos Genéticos*. Consejo Internacional de Recursos Fitogenéticos, Roma.

Crop Genebank Knowledge Base (2014), Procedures, Characterization homepage cropgenebank [online], Available: http://cropgenebank.sgrp.cgiar.org/index.php/procedures-mainmenu-242/characterization-mainmenu-205

Rife, Trevor W.,Poland, Jesse A., *Field Book: An Open-Source Application for Field Data Collection on Android*,Crop Sci. 2014. 54:1624–1627. doi:10.2135/cropsci2013.08.0579

International Rice Research Insitute (2014), (IRRI), Products. Homepage bbi.irri [online], Available: http://bbi.irri.org/products

The James Hutton Institute (2015), Information & Computational Sciences. Homepage ics.hutton.ac.uk [online], Available: http://ics.hutton.ac.uk/germinate-mobile/

Painting, K. A.; Perry, M. C.; Denning, R. A. y Ayad, W. G. *Guía para la documentación de recursos genéticos. Un enfoque autodidáctico para la compresión, análisis y desarrollo de la documentación de los recursos genéticos*. Roma: IBPGR, 1993. 310 p

Rao, N.K., J. Hanson, M.E. Dulloo, K. Ghosh, D. Novell y M. Larinde. 2007. *Manual para el manejo de semillas en bancos de germoplasma. Manuales para Bancos de Germoplasma* No. 8. Bioversity International, Roma, Italia.

Gonzalez Monroy, D.F.; Hernandez, A.M.; Machuca Villegas, L., "Mobile computing system to support the management of the seed production process in crop genebanks," *Computing Colombian Conference (9CCC), 2014 9th*, vol., no., pp.109, 114, 3-5 Sept. 2014

González Monroy, D.F.; Hernandez, A.M.; Machuca Villegas, L., *Aplicación Móvil de captura y sincronización de datos para la producción en campo e invernaderos del programa de recursos genéticos del CIAT*, Universidad del Valle, 2015, Cali, Colombia.

!Thank you!